



M.4s[®] PCL dynamic

Precise turns of the dial for individual therapy.

Care for your posterior cruciate ligament patients using the new medi M.4s PCL dynamic.

The PCL – injury, diagnosis, treatment

The PCL

Unlike the anterior cruciate ligament (ACL), the posterior cruciate ligament (PCL) has an intrinsic ability to heal and may regain functionality following an injury. However, in a PCL deficient knee, gravity and the forces on the joint from the hamstring muscles can potentially cause the tibia to be positioned in a posteriorly subluxed position relative to the femur. Healing of the PCL in an elongated position can lead to chronic instability and disability.²

Injuries

Injuries to the PCL are less common than those to the anterior cruciate ligament ACL. The prevalence of injury to the former varies between 1% and 44% of injured knees with a haemarthrosis.¹

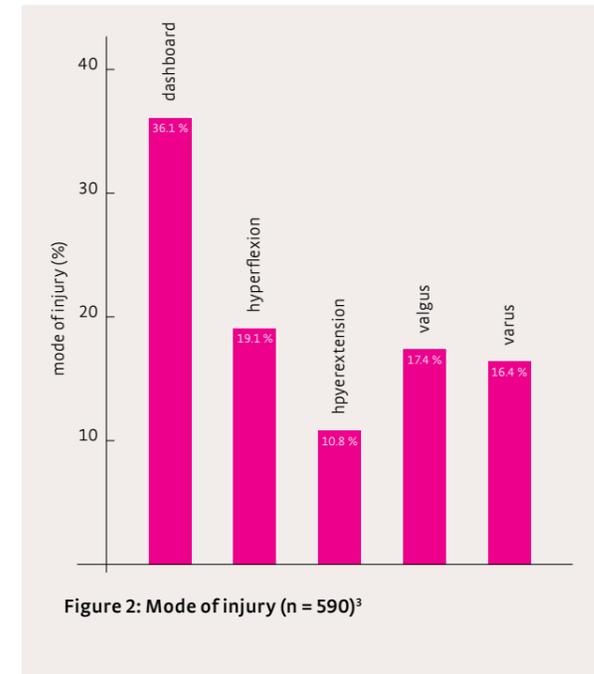
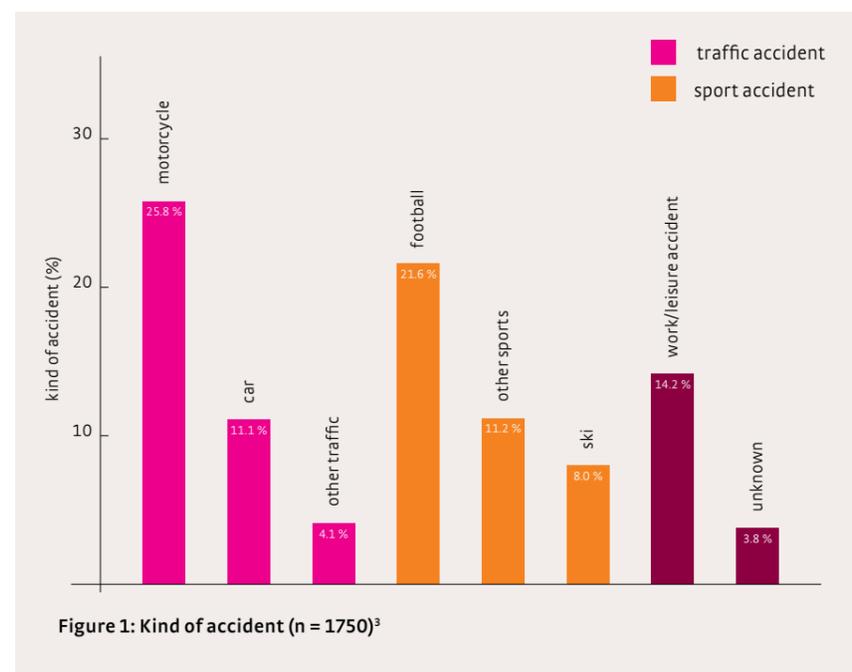
Causes:

Injuries of the PCL occur most commonly during traffic or sports accidents. The most frequent injury mechanisms are motorcycle and football accidents (Figure 1). More than 75% of patients are male. The injury is most common in the age group of 20-30 years old. Dashboard injuries and falls on the flexed knee are the main injury causes (Figure 2). 54% of patients with posterior tibial displacement values < 12mm on posterior stress radiographs were

classified as isolated ruptures. Sports injuries exhibited a significantly higher proportion of isolated lesions compared to traffic-related injuries. Knowledge of the most important injury mechanisms is an important requirement to reliably diagnose an injury of the PCL.³

Diagnosis

The diagnosis of acute and chronic injuries is often missed at initial evaluation. The posterior drawer test and the posterior sag test (Godfrey test) are considered the most sensitive tests for diagnosing PCL insufficiency. However, objective clinical quantification of posterior laxity by physical examination remains difficult. To improve diagnostic accuracy stress radiography has been introduced, which overcomes some of the limitations seen with clinical examination and arthrometer testing. With tibial displacement values > 12 mm, injury to peripheral structures, particularly the posterolateral corner structures, has to be considered. While magnetic resonance imaging (MRI) is a useful adjunct in the acute PCL injury its findings should not be used to infer functional status in chronic cases.⁴



Treatment

High quality, evidence-based treatment guidelines for isolated PCL injuries are lacking.¹ But it is widely recommended that patients with minor instability (grade 1 and grade 2) with a posterior sag ≤ 10 mm should be treated conservatively.¹ Those with higher-grade instability (grade 3), which is more commonly part of a combined instability may benefit from surgical reconstruction. Most studies on the conservative treatment of injury to the PCL have reported good results.¹ Patients with isolated injuries demonstrated successful healing of the PCL with reduction of the posterior tibial translation. They applied conservative treatment with the knee immobilized in a cast in full extension for up to six weeks. The cast held the tibia in an anterior drawer position. Subsequently, treatment was continued using a dynamic brace. This method confirmed that healing of the ligament is possible in an improved position with less posterior sag.¹ The treatment of PCL injuries depends on the timing and the degree of the injury, the patient's compliance and the patient's demands/level of activity.² Rehabilitation should focus on progressive weight bearing and emphasize quadriceps strengthening, while protecting the healing ligament or graft.²

Aim

Patients should be allowed to return to sports-related activities once they have painless active range of motion and adequate return of quadriceps strength.² To offer the patients the possibility of an early and dynamic treatment, medi developed the new knee brace M.4s® PCL dynamic. A biomechanical study presented on the next page clearly demonstrated, that the brace is able to hold the tibia safe and precisely in the desired position. Moreover, the posterior tibial translation is significantly reduced.⁵

¹ Jacobi M, Reischl N, Wahl P, Gautier E, Jakob RP. Acute isolated injury of the posterior cruciate ligament treated by a dynamic anterior drawer brace – a preliminary report. *J Bone Joint Surg Br* 2010; 92(10): 1381-1384.
² Pierce CM, O'Brien L, Griffin LW, LaPrade RF. Posterior cruciate ligament tears: functional and postoperative rehabilitation. *Knee Surg Sports Traumatol Arthrosc* 2013; 21(5): 1071-1084.
³ Ruße K, Schulz MS, Strobel MJ. Epidemiology of injuries of the posterior cruciate ligament (PCL). *Arthroscopie* 2006; 19(3): 215-220.
⁴ Schulz MS, Richter J. Diagnosis of PCL tears. *Arthroscopie* 2006; 19(3): 221-228.
⁵ Heinrichs CH, Schmoelz W, Mayr R, Keiler A, Schöttle PB, Attal R. Biomechanical evaluation of a novel dynamic posterior cruciate ligament brace. *Clin Biomech (Bristol, Avon)* 2016; 33: 20-25.

Biomechanical evaluation of a novel dynamic posterior cruciate ligament brace

The PCL acts as the primary stabilizer preventing posterior translation of the tibia relative to the femur. Gravity and dynamic loads caused by the hamstrings provoke posterior tibial translation (PTT) when the PCL is insufficient and the patient is lying in a supine position. It is therefore recommended that PTT should be kept to a minimum or at the pre-injury level during the ligament healing phase after PCL injury and during the graft incorporation phase after PCL reconstruction.⁵

The purpose of this biomechanical study was to evaluate the impact of the M.4s PCL dynamic with free degrees of flexion on PTT after PCL injury and reconstruction. It was hypothesized that the brace, which applies an anteriorly directed force to the calf, can reduce PTT after PCL injury and prevent PTT after PCL reconstruction. It was also evaluated whether increasing the anteriorly directed force to the calf can further affect PTT.⁵

Methods

A Telos stress device was used to provide PTT in seven human lower limb specimens, and stress radiographs were taken at 90° of knee flexion. PTT was measured in the native knees with an intact PCL; after arthroscopic PCL dissection with and without a brace; and after PCL reconstruction with and without a

brace. The force applied with the brace was measured using a pressure sensor.⁵

Findings

PTT was significantly reduced ($P=0.032$) after application of the brace with an anteriorly directed force of 50 N to the knees with the dissected PCL (Figure 3). The brace also significantly reduced PTT after PCL reconstruction in comparison with reconstructed knees without a brace ($P=0.005$; Figure 3).⁵

Conclusion

The novel dynamic knee brace presented here, with an anteriorly directed force applied to the calf, can reduce PTT after PCL rupture. After the brace was applied to the PCL-reconstructed knee, PTT was restored completely in comparison with the native state. This type of PCL brace can therefore be used after PCL reconstruction to overcome the drawback of initial knee immobilization and allow an earlier return to work. However, the in vitro laboratory results presented here need to be confirmed in a clinical investigation evaluating the effectiveness of the brace.⁵

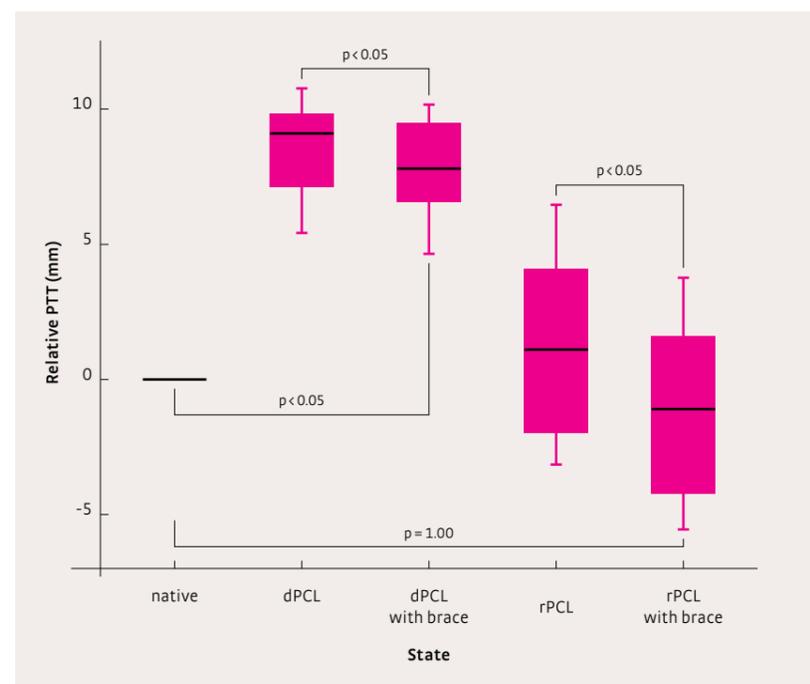


Figure 3: Changes in the PTT measurements relative to the native knee using the brace with an applied anteriorly directed force of 50 N. dPCL, dissected posterior cruciate ligament; rPCL, reconstructed posterior cruciate ligament.

International knee experts and their experiences with the M.4s PCL dynamic

Professor Philip Schoettle, MD, PhD



Professor Philip Schoettle, MD, PhD is Medical Director of the Department of Orthopaedics and Traumatology at ISAR Kliniken GmbH Munich.

In your opinion, which product features of medi's M.4s PCL dynamic are particularly valuable for therapy?

It is particularly helpful that I can exert force on the tibia from behind with the brace as it is a simple mechanism. The patient also understands the mode of action straight away. This means that this function also helps the patient understand why he is wearing the brace. It is light to wear and it is moveable. I can use it in a fixed position in the primary phase and then dynamically later on. And I can customise it to suit the patient: no matter how much force has to act on the tibia, I can set the orthosis individually.

Professor Adrian Wilson



Professor Adrian Wilson has worked since 2005 as a consultant at the North Hampshire Hospital in the UK and is the clinical head of the Knee Surgery Division.

How do you treat PCL injuries?

I am a supporter of the conservative method. That is to say: Firstly, the patient must not put any weight on their knee for six weeks, and this is followed by gradual application of weight and then full weight application after twelve weeks. However, if an operation is necessary, our patients are given the medi PTS immobilising brace for two weeks and are not allowed to move their knee during this time. After this, they are given a dynamic leg brace. We then increase the extent of movement over four periods, i.e. from 0 to 30 degrees, to 0 to 60 degrees, then to 0 to 90 degrees. After six weeks, movement is unlimited. Patients wear the leg brace as often as possible over a period of three months.

Dr Ramón Cugat Bertomeu



Dr Ramón Cugat Bertomeu is Head of the Department of Orthopaedic Surgery and Traumatology in the Hospital Quiron Barcelona and President of the Medical Association of the Catalan Mutual Insurance of Football of The Royal Spanish Football Association.

How good is patient compliance if a knee brace such as the M.4s PCL dynamic is used?

Compliance is very high. Professional football players want to play again as quickly as possible and not wear a plaster cast or a splint. They are very happy with the medi knee brace, because they may be able to walk again even on the first or second day. They get used to the brace very quickly and get on with it famously.

Associate Professor René El Attal MD



Associate Professor René El Attal MD is senior consultant and has also been head of the Knee Team at Innsbruck University Department for Accident Surgery since 2013.

You have conducted a biomechanical study with medi's M.4s PCL dynamic knee brace. What conclusions have you drawn?

It is the first biomechanical study that has ever been conducted on this subject. We chose a study design that is comparable to the actual clinical situation when treating patients. This enabled us to investigate how this orthosis acts on posterior tibial translation. We saw that we could significantly reduce this drawer with conservative therapy. We also saw that after an operation, this brace, together with the reconstruction, can completely restore the state of the cruciate ligament to how it was before the injury. That is a very good outcome indeed.

More Information

Find full statements and lectures from these international knee experts on our website: www.medi.de/en

M.4s® PCL dynamic

4-point rigid frame brace with extension / flexion limitation for treating injuries of the posterior cruciate ligament.

The latest product in medi's brace family holds the tibia in the desired position by actively exerting a force via the PCL protection pad. The brace is very comfortable to wear with its light, flat construction and the comfortable non-slip pads. This leads to high patient compliance which makes treatment safer and increases the patient's mobility.



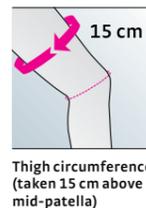
PCL protection pad

- The pad presses actively on the tibia and holds it in the desired position.
- Thanks to its shell shape the pad moulds itself perfectly to the calf.



Tensioning Dial

- The integrated tensioning dial enables the supporting pad to be adjusted exactly to suit the individual patient.
- The tensioning dial is very easy to lock and release.



Physioglide® TF hinge

- The physioglide hinge mimics the rolling / gliding movement of the knee and ensures a secure fit.
- The flat hinge construction enables the brace to be worn under clothing.



Tool-free wedge replacement

The flexion and extension wedges can be changed quickly and easily with built-in tweezers with no need for screws.



Pre-formed tibial pad

- The winged shape of the tibia cushion moulds itself perfectly to the anatomical shape of the shin bone.
- This distributes the pressure comfortably and effectively.

Circ. of thigh cm	Size	Product code	
		left	right
31 – 37	XS	G081201	G081301
37 – 45	S	G081202	G081302
45 – 51	M	G081203	G081303
51 – 57	L	G081204	G081304
57 – 65	XL	G081205	G081305
65 – 74	XXL	G081206	G081306

medi PTS

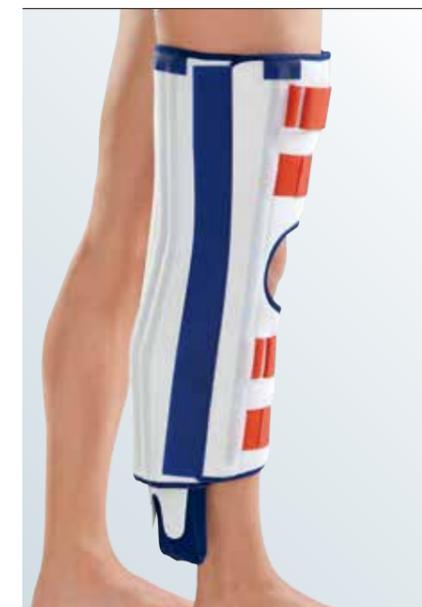
In the first period after PCL injury, a treatment with an immobilization brace can be the first choice to prevent posterior translation of the tibia.

Therefore medi offers the medi PTS. It is suitable for:

- Conservative treatment of recent PCL rupture / PCL instability
- Post-operative immobilisation after PCL reconstruction
- Treatment resistant patello femoral pain
- Extension deficit due to contracture of the posterior capsule fibres
- Acute anterior knee pain

More Information

www.medi.de/en



Rehab exercises your patients can easily do at home with the M.4s PCL brace

medi likes to support the rehab of your patients with selected physio exercises. Together with renowned knee experts medi offers a variety of exercises for mobilization and strengthening the knee muscles. Under the instructions of physiotherapist Jan Frieling from the German Olympic sports federation, your patients can download the exercises and do it at home. Here some examples:

More Information

More information to the exercises, lectures with international knee experts recorded at the ESSKA 2016 and much more you find on our website: www.medi.de/en



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